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ABSTRACT

A plan to diffuse instructional modules for the preparation of transportation professionals is presented, based on research and demonstration projects sponsored by the Urban Mass Transportation Administration (UMTA). The diffusion/adoption plan involves: developing instructional modules; disseminating the modules to professors teaching transportation courses at the college level; promoting the use and adoption of the modules; and evaluating and revising the plan. Transportation educators teach in a variety of disciplines (e.g., engineering, public administration, urban planning, and technology). Eight design and evaluation criteria for the instructional modules are listed, along with the procedures used by West Virginia University in developing the five instructional modules. The diffusion strategy involves repackaging UMTA research findings, change agents, and the use of information channels (e.g, television/radio, periodicals, direct mail). Adoption tactics include direct contact and conferences/workshops. Appendices include: a flow chart of the plan, a summary of diffusion research, and lists of relevant professional associations and periodicals. (SW)

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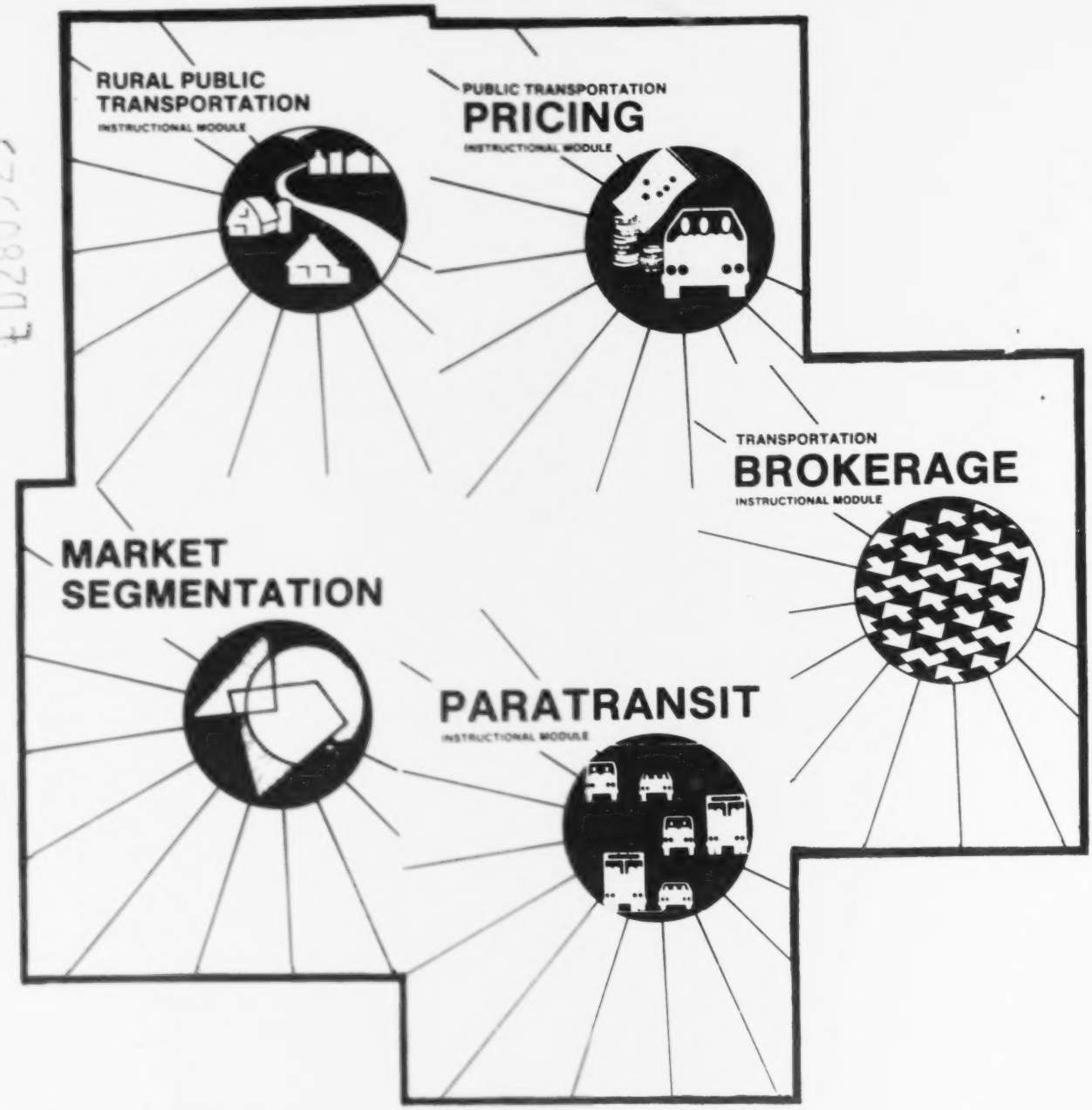

A PLAN TO DIFFUSE INSTRUCTIONAL MATERIALS FOR USE BY TRANSPORTATION EDUCATORS

by
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January 1986

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16. Abstract

This plan is designed to diffuse instructional modules based on UMTA/SMD sponsored research and demonstrations to transportation educators for use in the preparation of future transportation professionals. The diffusion/adoption plan has four major phases: development of instructional modules; promotion of the dissemination of the modules to transportation educators; promotion of the use and adoption of the modules; and evaluation and revision of the d/a plan.

The plan is based on diffusion research, the characteristics of transportation educators, the characteristics of the information to be diffused, and the criteria of appropriateness and cost-effectiveness. Methods used in the plan include the use of professional association conferences and publications, the use of direct mail, the use of the telephone, and regular contacts with early module users.

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Preface

Readers interested in the diffusion/adoption plan itself should direct their attention to Part III, The UMTA Diffusion/Adoption Plan, and particularly, the flow chart of the plan. The plan is self-contained and includes the information needed for its implementation.

Part I, Introduction to the Diffusion/Adoption Plan, provides a broad background of the assumptions, history and bases of this plan while Part II, Adaption of Diffusion Research to UMTA Needs, explains the way in which theory was utilized in the development of the plan. Appendix A provides a brief summary of diffusion research.

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A PLAN TO DIFFUSE INSTRUCTIONAL MATERIALS FOR USE BY TRANSPORTATION EDUCATORS

Part I - Introduction to the Diffusion/Adoption Plan

Objectives of the Diffusion/Adoption Plan

This plan is designed to diffuse instructional modules based on UMTA/SMD-sponsored research and demonstrations to transportation educators for use in the preparation of future transportation professionals. The plan is not designed to diffuse a new method of education but rather new content concerning public transportation. Often, public transportation is considered to involve operators managing "a system". UMTA research has shown that ideally public transportation provides mobility to people through a variety of modes, operators, and contractual arrangements. Such mobility is often best provided by careful innovation based on the needs and markets in the target area.

The diffusion/adoption plan has four distinct phases:

1. Development of instructional modules based on the content to be diffused.
2. Promotion of the diffusion of the modules to transportation educators.
3. Promotion of the use and adoption of the modules.
4. Evaluation and revision of the diffusion/adoption plan.

Background of the Diffusion/Adoption Plan

In 1974 UMTA created the Service and Methods Demonstration (SMD) Program to promote the development and widespread adoption of innovative transit services and efficient transit management techniques. The SMD program has developed new techniques and lessons in many areas including bus and rail equipment design, automation, paratransit, rural transportation, and coordinated transportation planning.

In the late 1970's UMTA became interested in the question of how to transfer the knowledge gained from their federally-sponsored research and demonstrations. This concern lead to an interest in the means by which UMTA might facilitate the process by which transit systems adopted SMD-developed management and operating improvements. After research and pilot projects, UMTA developed a Public Transportation Network of resource contacts, regional facilitators and developer demonstrators to promote the use of previously demonstrated service and management innovations by the transit industry. This network has been partially implemented.

UMTA also became interested in spreading the knowledge gained from SMD demonstrations to future transportation professionals during their formal education. The availability of SMD reports in Washington appeared to have little effect on the traditional college and university courses which dealt with public transportation, thus many transportation students remained unaware of the significant and exciting changes occurring in the management of public transportation systems.

In 1983 UMTA funded the Program for the Study of Technology at West Virginia University to undertake a Transportation Education Project to

develop instructional modules based on UMTA/SMD innovations in three areas: paratransit, market segmentation planning, and transportation brokerage. To facilitate their use in a variety of transportation courses the modules were designed as flexible, concept-based introductions to the topics with illustrations and organization which permitted easy reproduction and use of all, or part of, each unit.

The modules were reviewed and field tested by transportation educators. During 1985, the project team developed additional modules on the topics of rural transportation and public transportation pricing. In addition, this diffusion and adoption plan was researched and developed with the goal of widespread adoption of the instructional modules by transportation educators.

Assumptions in Plan Development

1. The transfer of UMTA/SMD-developed knowledge to future transportation professionals during their formal education is very important.

2. Carefully designed and targeted diffusion/adoption plans are more cost-effective than generalized approaches.

3. Diffusion research is critical in the design of successful diffusion/adoption plans.

4. Technology transfer is a complex, human, non-technical, process which requires careful planning and a flexible, feedback-oriented implementation process if it is to be effective.

5. An effective time to communicate up-to-date research-based concepts to future transportation professionals is during their formal education.

Bases for the Diffusion/Adoption Plan

This plan was developed on the basis of the following resources:

1. Research into processes of diffusion and adoption.
2. Investigation and trial of various tactics selected for the promotion of the awareness and use of these modules.
3. Direct contact over two years with transportation educators during the development and revision of the instructional modules.
4. Direct contact with transportation educators and others in the development, testing and revision of the d/a plan.
5. Experience of team members in related transportation education efforts.

Part II. Adaptation of Diffusion Theory to UMTA Needs

The target audience of this plan is professors teaching transportation courses in colleges and universities. They are notable as much for their diversity as their commonality. This section explores these characteristics and their implications for the diffusion process.

Characteristics of Transportation Educators

Transportation educators are scattered throughout hundreds of colleges and universities. They teach in a variety of disciplines including engineering, public administration, urban planning, technology, geography, and so on. There is no directory of people who teach formal courses about transportation. In addition, these professors have a wide variety of values and interests- topics taught range from freight distribution and traffic control to the optimum spatial arrangements of

urban areas. Some professors teach only one transportation-related course while others teach only about aspects of transportation.

Implications of Educator Characteristics

1. Because transportation educators are scattered and no central directory exists, one of the most important components of disseminating materials to them is to identify and locate them.

The identification and location of transportation educators is a potentially endless task. In practice, it is recommended that the change agents concentrate initially on professors who are members of professional associations. There are two reasons for this recommendation-members of professional associations are relatively easy to locate, and they tend to be the opinion leaders and early adopters in their fields.

2. Because professors work in scattered locations, it is critical to discover where they meet professionally and which publications they tend to contribute to and read.

The only major meeting places of these professors are various professional conferences related to transportation and/or their respective disciplines. In addition, the publications most likely to be read by transportation educators are among those of these associations. A list of associations which have been identified as having transportation educators among their membership is included as Appendix D.

3. Because transportation educators teach in a variety of disciplines and have a variety of interests, it is critical that materials for dissemination be flexible and concept-based.

Transportation educators involved in the research on which this diffusion/adoption plan is based have recommended that supplemental

material be flexible, well-organized, and supported by illustrations.

4. Due to the variety of interests of transportation educators and the nature of transportation course content, module topics will not be relevant to the courses of certain professors.

Because some professors will not use these materials, change agents should concentrate their efforts on professors who express interest in the project. All professors who can be identified should be made aware of the modules but broadcast mailings of the modules themselves are not recommended.

5. Transportation educators work in colleges and universities and they are the final arbiters of the specific material they choose to teach.

It is not appropriate for the change agent to implicitly or explicitly tell professors what they should teach but it is instead intended that professors be made aware of the availability of the instructional modules and why UMTA, the change agent, and others, consider the content important.

Characteristics of Content to be Transferred

The content to be transferred to future transportation professionals consists of concepts and knowledge which have resulted from research and demonstrations in public transportation. The major lessons of UMTA/SMD work are conceptual and not technical. Such ideas as market and needs-based planning, the use of a variety of transportation modes, and the importance of private sector involvement are all central lessons for transportation professionals and users to understand.

Strategy for Diffusion of UMTA Research Findings

Role of Repackaging Research Findings. To successfully translate the information contained in the reports of UMTA-sponsored research and demonstrations into a form usable in transportation courses, it was necessary to analyze and synthesize the content and organize it into instructional units appropriate for use by transportation educators. The synthesis of UMTA research and demonstration results into flexible, concept-based instructional units improves the potential for adoption of this content. The original reports were not designed for, nor are they generally appropriate for, classroom use.

Characteristics of innovations which are generally recognized as facilitating adoption are discussed below in connection with the design of the instructional modules. Appendix A of this plan contains a summary of diffusion research for readers desiring more information in this area.

Relative advantage refers to the basic motivation for utilizing this content innovation. Packaging UMTA's acquired knowledge as instructional units increases its image as material which is valuable for use by transportation educators and also demonstrates that UMTA considers its own acquired information important enough to be disseminated to future transportation professionals. The instructional modules also offer a professor simplicity by summarizing the overall thrust of UMTA's experience in certain areas. Professors in many disciplines, even those unfamiliar with public transportation, can understand and use the modules.

The modules also provide ease of use in comparison to the original reports. In effect, the professor is no longer required to obtain,

analyze and synthesize large numbers of reports in order, for example, to teach a one hour summary of recent advances in paratransit planning. The flexibility of the modules also allows ease of trial as the professor can utilize any part of the text or illustrations at any time through simple photoduplication. In addition, the information is presented in one clearly titled and well organized document.

In addition, packaging of UMTA-developed knowledge into instructional modules makes it more compatible with current course materials. University professors are accustomed to materials which are flexible and which contain clear illustrations, follow-up questions, chapter purposes and summaries, and extensive reference lists.

In summary, the repackaging of research findings from official reports to instructional units designed for educators is essential as the first phase in the effort to promote widespread adoption of this new content by educators who prepare future transportation professionals. The criteria used to design the modules and the extensive external evaluations used to improve them have each served to maximize the potential for widespread adoption of this content.

The Role of the Change Agent. The role of the change agent is to "influence clients' innovation decisions in a direction deemed desirable by a change agency" (Rogers, 1983). In this case the role involves the promotion of the use of instructional modules based on new concepts in public transportation planning and management by transportation educators. So, the object of the change agent is to distribute instructional modules and to promote their use in university transportation courses.

Research indicates that a change agent's two most important assets

in promoting adoption of innovations are homophily and credibility. Homophily refers to a similarity of attitudes, beliefs, and status between the change agent and the potential adopters. In this case, the ideal change agent would have a graduate education background and would understand the roles and demands of college and university professors. Of course, direct personal contact with professors and a sympathetic attitude are essential and can provide a modicum of mutual understanding between the change agent and educators.

Credibility in this diffusion/adoption effort involves a deep understanding by the change agent of several fields including: the current state of transportation education in the U.S.; the evolution of UMTA SMD research; and the genesis of the modules which he or she is attempting to diffuse. A change agent without this background knowledge should make its acquisitiion their first priority. Such training would include meetings with UMTA SMD officials, a training visit to the project team in Morgantown, trial and public teaching from the modules, and extensive project-related readings. Credibility is critical for the change agent and it cannot often be regained if wasted.

Once selected and trained, the change agent will be prepared to implement this plan. The role of the change agent will involve travel, presentations, phone contacts and a significant proportion of organizational and administrative work. The two most important skills a person can bring to any change agent job are human relations and intellectual competence (Schmitt et al, 1984). A careful reading of the plan itself will delineate the change agent's role in this project more clearly.

Usually, the first job of a change agent is to select a

communications strategy incorporating the messages to be transferred and the channels to be used which is tailored to the needs and values of the target audience. This plan provides such a strategy and the specific means needed for its implementation. Initially, the change agent's role will consist not of a developing a plan, but of implementing this plan. Later, after formative evaluation of results of particular efforts, the agent will be able to modify elements of the plan if necessary.

Use of Information Channels. The references and summary of diffusion research given in Appendix A contain valuable guidelines for the selection and use of information channels in the promotion of adoption. Some general conclusions are listed below and each is followed with a description of its influence on the development of this plan.

1. In general, mass media channels should be used before personal contacts to promote widespread awareness of the innovation and the diffusion effort.

This is important both because early adopters tend to be receptive to mass approaches, and because all adopters need to go through an awareness process before they become willing to consider actual adoption. It is for this reason that the diffusion/adoption plan is divided into a mass media oriented dissemination phase and a later adoption phase oriented towards personal contact.

2. "A diffusion strategy which utilizes short written materials to initiate and/or facilitate the establishment of personal contacts may be particularly effective" (Magill et al, 1981, p. 27)

This suggestion was actually written with regard to diffusing UMTA SMD innovations to professionals in the transit industry but it is

generally applicable to scattered professional audiences. The D/A Plan will follow this approach by using a mailing as one of the original tactics. The mailing will be designed to motivate educators to either call or write the change agent to order, or ask questions about, the modules.

3. The initial written materials about an innovation should be "a concisely written, nontechnical description" of the innovation (Mogavero and Shane 1982, p. 19).

The initial mailing for the project will consist of a foldout brochure describing the purpose and uses of the UMTA instructional modules. It is designed to highlight the benefits of using the modules and the ease with which this can be done. The brochure will also be distributed directly at professional conferences.

4. Channels of communication are not exclusive and the use of multiple channels has been shown repeatedly to be more effective than any single one.

This plan was designed to employ as many cost-effective information channels as possible. Despite its limited use of resources, the plan utilizes mass channels such as mailings and articles and personal channels such as direct contact at meetings. In addition, phone contacts and public presentations have been stressed due to their unique value as combinations of personal and mass communication channels.

5. Working with early adopters is critical because "the imitation by potential adopters of their near-peers is the key to the adoption process" (Rogers, 1983, p. 293).

Personal contact is the key to influencing potential adopters, and the most effective contact is with peers who have successfully adopted.

Professors are more homophilous and credible to each other than a change agent can be. One of the critical adoption tactics of the plan is the promotion of involvement by early adopters in the diffusion process. Early adopting professors can be encouraged to write and speak about their uses of the modules and informed of specific oppurtunities to do so. This is a complex process, however, and the change agent can only have a limited effect on formal and informal professional exchanges.

Overall Strategy of the D/A Plan

In summary, the overall strategy of the diffusion/adoption plan consists of two major phases as well as ongoing evaluations. The first phase (dissemination) involves locating as many transportation educators as possible through mass channels and encouraging them to contact the change agent about instructional units containing the UMTA/SMD-developed content to be diffused. The second phase (adoption) involves personally encouraging interested professors to order and use the modules, and later contacting those who have ordered and used the modules to discover their experiences and to encourage them to participate further in the project.

The following section of the plan discusses which specific tactics, or methods, are appropriate and cost-effective for the successful implementation of this overall diffusion/adoption strategy.

Criteria for Selection of Tactics for the UMTA Diffusion/Adoption Plan

To be utilized in the implementation of the plan's overall diffusion strategy, specific tactics must:

1. Contribute directly to either the mass-media oriented dissemination phase or the personal contact oriented adoption phase of the plan.

Dissemination tactics must reach transportation educators and

motivate them to contact the change agent with an order or query. Adoption tactics must permit personal contact and must result in professor trials of, and adoptions of, the instructional modules.

2. Be cost-effective.

The cost-effectiveness of dissemination tactics will be measured in actual time and money spent per information request and per order. The cost-effectiveness of adoption tactics is ideally based on the cost in time and money per classroom trial and per adoption. The results of adoption tactics, however, are more difficult to predict and measure than the results of dissemination tactics because trials and adoptions are not as accessible to the change agent as information requests.

3. Be consistent with diffusion research and transportation educator characteristics.

The implications of diffusion research for the use of information channels and the role of the change agent were discussed earlier. A major lesson of diffusion research is that both the message and medium of communications must be tailored to the potential adopters. Transportation educators, as discussed earlier, would probably not respond to a promotional lottery in a mailing designed to diffuse instructional materials to this group, but they might read and use free materials in return for writing short critiques.

4. Permit implementation by change agents not already associated with this project.

This plan is designed to be usable by UMTA personnel or by anyone chosen by UMTA. The implementation of particular tactics should only require the background and training described in the section on the change agent's role.

5. Be consistent with UMTA's role.

The expertise of UMTA is in transportation and the goal of this project is to diffuse knowledge about transportation to future transportation professionals. Selected tactics should not involve the change agent in educational issues related to proper curricula for higher education, but rather should focus on informing professors of the value of the instructional units and encouraging their use where appropriate.

Evaluation and Selection of Dissemination Tactics

The following statement summarizes the criteria for dissemination tactics:

> Tactics selected for the dissemination phase should permit any chosen change agent to appropriately and cost-effectively motivate transportaton educators to order or inquire about the UMTA/WVU instructional modules.

The key to the dissemination phase is the use of mass information channels because they are more cost-effective in promoting interest than individual personal contacts. The major mass channels considered included television, radio, the telephone, periodicals, mailings, existing diffusion networks, and group presentations.

The use of television and radio was rejected due to the high initial cost of program production and the low level of anticipated benefits as a result of the improbability of reaching scattered potential adopters.

The use of periodicals is recommended due to the modest initial cost of material preparation and the potential of reaching a significant number of transportation educators with a single announcement, article or review. The success of this tactic depends on the specific periodicals

employed. Research indicates that journals of professional associations with transportation educator members are the most likely to maximize the cost/benefit ratio of this tactic. A list of such periodicals is included as Appendix D.

There are many possible approaches to using professional publications. It is recommended that all of the following be pursued:

- o submission of instructional modules for review
- o submission of press releases to locate transportation educators with a potential interest in the project
- o submission of academic articles discussing the importance of UMTA's efforts to transfer research findings to educational institutions.

These approaches represent a variety of low-cost means to directly reach transportation educators through professional publications. Other uses of publications which are not as low-cost or as effective are not recommended. The purchase of paid advertisements was rejected because more effective results can be obtained with no publication cost. The use of state highway technology transfer newsletters was rejected because research indicated a lack of response to transit-based materials targeting educators in newsletters which target state highway personnel.

Direct use of the phone to inform transportation educators about the existence of the project was not recommended for the dissemination phase because it is not cost-effective or appropriate as a mass informational tactic. It is recommended as a tactic for the more intensive and personal adoption phase.

The use of direct mail provides an extremely effective and low-cost means of informing scattered groups if the members can be located. The use of direct mail is recommended but it necessitates the prior

development of a usable mailing list. It is recommended that professonal associations be queried to help locate transportation educators among their members either through internal records or published queries. In addition, all educators previously contacted by the transportation education project should be included. The basis of such a mailing list is included as Appendix H.

The recommended first mailing consists of a cover letter and a brochure describing the purpose and nature of the modules, and providing a form for orders and a phone number for questions. A proposed brochure has been included as Appendix F. Additional mailings should be considered after a formative evaluation of the results of the first one.

The use of existing diffusion networks is not recommended because there are no networks which target transportation educators in higher education. The networks with the most similarity to the mission of this project are the Public Transportation Network (PTN) of UMTA/SMD, the National Diffusion Network (NDN) of the Department of Education, and the University Research Centers of UMTA/URT. Research has indicated that the PTN is designed to target public transportation systems, the NDN largely provides new educational methods to elementary and secondary schools, and the University Research Centers conduct transportation research and train transit management. None of these networks has a means of communicating with more than a few transportation educators.

Presentations at conferences are recommended where feasible because they combine aspects of mass and personal communication. While conference presentations are more expensive per educator contacted than other suggested tactics, they are also more powerful. Such presentations provide a potential double payoff due to the personal contact with a

number of target individuals. In addition, it is generally the innovators and opinion leaders who attend such meetings and the change agent can receive direct feedback which reflects the consensus of potential adoptor opinions.

Such presentations are feasible when they can be arranged in advance and when it can be reasonably presumed that transportation educators will attend the session. The presentation should consist of information about the instructional modules and how they meet UMTA's need to transfer knowledge while providing valuable resource materials to professors. Ample time should also be provided for questions and discussion about the project to answer individual points and provide the change agent with feedback.

The major recommended dissemination tactics are included in these three categories:

- o the use of professional publications;
- o the use of direct mail; and
- o the use of presentations at professional meetings.

Evaluation and Selection of Adoption Tactics

The following statement summarizes the criteria for adoption tactics:

> Tactics selected for the adoption phase should permit any chosen change agent to appropriately and cost-effectively motivate transportaton educators to utilize and adopt the UMTA/WVU instructional modules.

The key to the adoption phase is direct personal contact between potential adopters and both early adopters and the change agents. Direct

personal contact is more costly in time and money than mass informational channels but such contact is essential if educators are to decide to utilize the instructional modules. Such direct contact should occur after the professors have been made aware of the project and the modules. Major adoption tactics considered include conference attendance, sponsored workshops, direct phone contact with interested professors, regular contact with early adopters, and the establishment of an ongoing newsletter.

Attendance at conferences is recommended because it is the least expensive tactic which permits direct face-to-face contact with transportation educators individually and in groups. Professors attend such conferences in part to discover innovations occurring in their field. By being present both formally and informally at such gatherings, change agents can enhance the credibility of their efforts and the entire project. In addition, professional contacts can be established which will permit the establishment of an ongoing network that the change agent can foster and utilize from his or her office.

This tactic requires that the change agent research various professional conferences to determine which will facilitate the most contact with potential adopters. Time at the conference should be utilized to discuss the project, and transportation education in general, with interested transportation educators on both formal and informal terms. Addresses and interests of transportation professors should be noted for future follow-up.

Sponsored workshops in either Washington DC or central regional locations are not recommended as an adoption tactic. While they could be very effective in motivating professors to utilize the modules, sponsored

workshops are extremely expensive in both time and money. Because the modules contain new content and not new educational practice, it is doubtful whether sponsoring educational workshops would be an appropriate role for a transportation agency such as UMTA.

Direct phone contact with potential adopters is recommended as an adoption tactic. It provides many of the benefits of face-to-face contact at a far lower cost in both time and money. With a scattered target group that requires personal contact, the use of the telephone is required. Some of the following activities should involve direct phone contact with potential adopters:

- o responses to written inquiries;
- o follow up of professors who previously ordered modules;
- o follow up of contacts from conference attendance;
- o follow up of reviewers and field testers from the module development phase of the project; and
- o recruitment of opinion leaders to become involved in the project in various capacities.

During phone contacts with potential adopters the change agent should generally discuss topics related to the instructional modules. These might include: the origin and structure of the modules, the professor's transportation courses, the UMTA/SMD program, the role of formal education in preparing transportation professionals, and related issues. The final goal would be to locate and motivate those professors interested in reading and utilizing the modules.

Regular contact with early adopters is recommended. Early adopters are a critical and credible source of information for potential adopters, and the change agent should maintain regular contact with them. There is no single approach to involving early adopters in the diffusion/adoption

process as their interests and inclinations will vary widely. However, the establishment of a network of adopters can be facilitated by phoning them regularly, by meeting with them alone and in groups at conferences, and by mailing them news about the project.

Early adopters can be encouraged to communicate their successes with the modules by:

speaking informally with others;

writing papers for presentation;

submitting reviews or related articles to publications; and by

speaking with potential adopters referred by the change agent.

The change agent should also attempt to create specific opportunities for early adopters to publish, present or share experiences related to the instructional modules.

Distribution of an ongoing newsletter is not currently recommended as a tactic to promote adoption. A newsletter could contribute to the formation of a network of educators who utilize the instructional modules. However, it is difficult to design a newsletter which targets educators at colleges and universities without its content broadening to include general treatment of educational issues. It is problematic whether such a newsletter is an appropriate use of the funds of an agency devoted to transportation, and not education. While a newsletter for transportation educators would serve many useful functions,it is not recommended as a part of this diffusion/adoption plan.

The major recommended adoption tactics are in three categories:

- o the use of the telephone
- o the use of conference attendance
- o regular contact with early adopters

Resources Needed for Plan Implementation

The implementation of this diffusion/adoption plan requires a one year sustained effort by the following diffusion/adoption project team:

- o Project Director - 15% of time. Coordinate and manage overall diffusion effort. Attend several conferences. Supervise staff.
- o Change Agent - full-time. Implement diffusion/adoption plan tactics. Attend professional conferences. Utilize information channels. Maintain records.
- o Secretarial and Clerical Assistant - half-time each or one full-time person. Administrate project details. Manage computer files such as mailing list. Write letters. Secretarial duties.

Overhead costs of the diffusion/adoption plan include:

- o Two or three dedicated offices with desks, files, typewriters, and a dedicated phone line; and
- o A computer system with word-processing and file management software.

An estimate of operating expenses includes:

- o Long distance telephone costs - $1,500;
- o Postage costs - $600;
- o Travel to conferences - $2,600;
- o Printing - $750; and
- o Supplies - $600

Specific cost estimates for team personnel and overhead expenses have not been given as such costs vary widely depending on the institution which implements the plan. Estimates of operating expenses are based on a one year test of the diffusion/adoption plan.

Part 3 - The UMTA Diffusion/Adoption Plan

Overview of Plan Structure and Use

The diffusion/adoption plan is composed of four major phases:

1. The repackaging of research findings in instructional units;
2. The promotion of knowledge and awareness - the dissemination phase;
3. The promotion of involvement and use - the adoption phase; and
4. The formative and summative evaluations of the D/A process.

The change agent will be primarily concerned with the implementation of phases two through four as the repackaging of research findings in instructional units has already resulted in five finalized and field tested modules. The implementation of the D/A plan involves promoting the diffusion and adoption of these five units by transportation educators.

The plan phases are listed in order of initial implementation but they actually overlap and interact in practice. The diffusion phase tactics do not end during the implementation of the adoption phase and evaluation should be an ongoing component of the D/A project team activities. For this reason, the sections on phases two through four will enumerate the specific steps that must be accomplished to successfully implement each of the tactics. An overall outline of the the plan's implementation will be included after the prescriptions for each phase.

The role of the change agent requires judgment and flexibility based on changing circumstances. The project team must take a role in deciding which tactics to pursue during a given week based on current project results. In the early stages of the diffusion and adoption effort, the plan and the suggested order of actions should be used as a blueprint.

Later in the year, the project team will have access to evaluation data which are not currently available and the plan should be used as an overall guide which can be modified if necessary. Specific tactics may need to be emphasized or refocused depending on their initial results.

Phase 1 - Repackaging of Research Findings in Instructional Units

Selection of Content and Topics

The topics of the instructional modules were selected after consultation between the project staff and UMTA. The topics were selected to include content areas to which UMTA/SMD research has made major and recent contributions which are of value for future transportation professionals to learn during their formal education. The five completed modules are on the topics of paratransit, market segmentation analysis, transportation brokerage, transportation pricing and rural public transportation.

Design Criteria for Instructional Modules

The discussion of "The Role of Repackaging Research Findings" on page 7 describes how the modules were designed to facilitate their adoption by transportation educators. Eight criteria were developed for use in the design and external evaluations of the modules. The instructional modules were designed to:

1. Fit a cross-section of existing courses;
2. Be adaptable to varied class schedules;
3. Be concept-oriented;
4. Ensure low-cost reproduction and use;
5. Be designed for use by faculty;
6. Allow for effective use by professors unfamiliar with module content area.;

7. Be self-contained teaching units; and

8. Stimulate interest in new transportation methods.

A large majority of external reviewers and field testers reported that the five developed modules meet each of these criteria.

Procedures for Developing Modules

The five instructional modules were developed at West Virginia University using the following procedures:

1. Analyze UMTA-developed materials and, in conjunction with UMTA, select content best suited for repackaging into diffusable instructional modules.
2. Analyze topic, and relevance of UMTA research, and produce draft instructional unit.
3. Arrange for review of module draft by selected content experts and transportation educators.
4. Revise drafts based on external reviews and prepare finished modules.
5. Arrange for in-class field testing of modules by college and university transportation educators.
6. Prepare and submit camera-ready copy of completed modules.

Professors and content experts who have reviewed and/or field tested the instructional modules are identified in Appendix E.

Phase 2 Diffusion- Promotion of Knowledge/Awareness

> The objective of the diffusion phase is to appropriately and cost-effectively motivate transportation educators to order or inquire about the UMTA/WVU instructional modules.

Three major tactics are involved in the diffusion phase of this plan: the use of professional publications; the use of direct mail; and the use of presentations at professional meetings. The selection of these tactics was discussed in the section on "Evaluation and selection of diffusion tactics". Listed below are the procedures necessary to implement each of the Phase 2 tactics. Following the discussion of phases two to four there will be an ordered list of the steps necessary to implement the entire plan.

Procedures for the Use of Professional Publications

1. Contact the professional associations and related periodicals listed in Appendix C and Appendix D. Determine if they have transportation educators among their readership. If so, ask them if they will publish:

a. press releases announcing module availabilty and requesting transportation educator names and addresses;

b. articles about the diffusion of UMTA/SMD knowledge and its importance for transportation education; and/or

c. reviews of the modules themselves.

2. Talk directly with the editor of any publication which expresses an interest in publishing the above materials about the exact nature of the item to be printed. Find out, for example, what facet of the project should be stressed in a press release or whether they wish to review the modules themselves.

3. Prepare and submit materials for publication to each periodical which expressed interest. A sample academic article about the transportation education project, UMTA/SMD and transportation education in general is included as Appendix F. A brochure promoting awareness of the instructional modules is included as Appendix G.

4. Contact periodical editors two weeks after each submission of materials to ask if they received it and if they have decided where, when, or whether they will publish it. Discuss the project in general with the editor and answer any questions. Contact the editor regularly until a decision is reached on publishing the materials.

5. Keep careful records of all publications concerning the project and of all formal and informal feedback received by the project team. In particular, obtain the names and addresses of all respondents and note their comments or orders. This data is critical for the successful implementation of other tactics and for project evaluations.

Procedures for the Use of Direct Mail

1. Contact the professional associations listed in Appendix C and, after explaining the project, inquire if it is possible obtain the names and addresses of transportation educators who are members of their associations. A list of members of an education or transportation committee may also be requested. If such a list is not available, inquire about placing a press release as described in the previous section to locate potential adopters.

2. Obtain available lists and add the names to the mailing list which has been compiled as Appendix H. Part of step 1 has already been completed.

3. Prepare and mail announcement package consisting of brochure and computer-generated personal letter to all names on the transportation educator mailing list. A sample brochure is included as Appendix G. The mailing list should be entered on the computer system to facilitate mailings and list management functions.

4. Respond to inquiries and fill module orders resulting from the mailing. Fill orders quickly and bill if necessary. Respond within one week to all written inquiries and follow-up phone inquiries with written confirmations. Ask all callers if their address and title was listed correctly. Note changes.

5. Keep careful records of all responses to mailings and how they were dealt with. Keep records of orders for use in the adoption phase.

6. Consider another informational mailing particularly if the mailing list grows or if the first mailing is extremely successful. Use the regular formative evaluations to make this decision.

Procedures for Presentations at Professional Meetings

1. Contact professional associations to determine when their annual meetings will be conducted and whether they expect a significant number of transportation educators to attend. If there is a potential target audience, determine the possibilities of presenting the project and related issues to a session at the meeting. It will probably be necessary to contact several officers of the association to determine the possibilities for a presentation. Chairpersons of transportation or education committees should also be contacted.

2. Prepare and submit a paper for presentation to those associations which exhibit potential interest and potential adopters. A sample paper for presentation is included as Appendix F. If paper is not accepted, it

may still be advisable to attend the meeting as part of the adoption phase tactics. If attendance at the meeting is not feasible, arrange to send brochures for distribution to the attendees.

3. Attend conference and make presentation. Learn as much as possible about the audience before your presentation. Talk clearly and allow time for questions. Identify individuals with comments or questions. If possible, obtain the names and addresses of session attendees. Tailor the presentation to the specific interests of the association holding the conference. Identify potential adopters and converse with them informally after the session.

4. Follow-up session participants. Mail brochure packages to those attending the session. Use adoption tactics to follow up on any transportation educators displaying interest in using the instructional modules.

4. Keep careful records of the presentation and responses. Write notes after the presentation and expand them later. During formative evaluations refine presentation approach and methods of dealing with associations to obtain presentation time.

Notes on Implementation of Dissemination Tactics

The first step in implementing each of these tactics is to contact professional associations. These calls may be combined as it is possible to make a number of related queries in a single phone call. It will, however, be necessary to call a number of individuals in each association. The overall order of plan implementation is discussed after the procedures for each phase are enumerated.

Each tactic requires careful record-keeping. This is essential for the formative and summative evaluation processes. Detailed data will permit the project team to decide whether to alter or emphasize specific tactics during the second half of the plan implementation year.

Expected Outcomes of Diffusion Tactics

It is expected that the implementation of the above tactics will result in:

- o Expressions of interest and questions about the project and the instructional modules;
- o Orders for the instructional modules.
- o A few early adoptions of the modules; and
- o Informal feedback regarding the instructional modules, the project overall, and the specific diffusion methods used.

Phase 3 Adoption- Promotion of Involvement

The objective of the adoption phase is to appropriately and cost-effectively motivate transportaton educators to utilize and adopt the UMTA/WVU instructional modules.

Three major tactics are involved in the adoption phase of this plan: the use of the telephone, the use of conference attendance, and regular contact with early adopters by a variety of means. The background of their selection was discussed in the section on "Evaluation and selection of adoption tactics". Listed below are the procedures necessary to implement each of the Phase 3 tactics.

Procedures for the Use of the Telephone

1. Obtain dedicated phone number and print the number on the project brochure,outgoing letters, and press releases.

2. Determine approach and content to use in various telephone situations typical to this project. Such situations include: receiving a request for information; following-up on an order; calling an association for information; and following up on a conference contact. In determining the approach to take remember the objectives of the project - to promote adoption of the instructional modules by transportation educators.

3. Practice role-playing telephone calls with project team members. Professors who were previously involved in the project may also be asked to assist in role-playing specific situations. Such professors are listed in Appendix F. Discuss the project, professors' courses, and the UMTA/SMD knowledge being diffused through the modules. The amount of role-playing which is necessary will depend on the change agent's experience with public transportation and higher education.

4. Set up a system to schedule phone calls and use it, for example, to follow-up on module orders two weeks after mailing them. Make calls in groups at times when the change agent will be available to speak with those returning calls.

5. Keep careful records of all phone contacts. Keep records of each person spoken to, the topics discussed, and any necessary follow-up actions. In general, try to follow-up significant conversations with confirmation letters.

Procedures for Use of Conference Attendance

1. Contact professional associations to determine the dates of their major meetings and whether they expect transportation educators to

attend. This step will be completed during the diffusion phase of the project.

2. Decide which conferences to attend. First priority are those conferences where the project will be presented. The second priority conferences are those which have a large number of transportation educators attending. The project team will need to estimate the costs of one or two persons attending each of the conferences and decide on the optimal expenditure of funds allocated for travel in the diffusion/adoption plan budget.

3. Attend the conferences and promote module adoption by transportation educators. Suggested activities include:

- o distribution of brochures;
- o formal and informal contacts with potential adopters;
- o attendance at sessions related to transportation and/or education;
- o conversations with early adopters and module reviewers;
- o display of modules for inspection; and
- o collection of names and addresses of transportation educators.

4. Follow-up on conference attendance. Write and call project contacts which were initiated or renewed at the meeting. Fill orders and respond to questions.

5. Keep careful records of activities at the conference and their results. Keep records of each person spoken to, the topics discussed, and any necessary follow-up actions. In general, try to cement significant conversations with confirmation letters. During formative evaluations discuss possible methods of increasing the benefits of conference attendance.

Procedures for Regular Contact with Early Adopters

1. Contact professors who have the instructional modules to determine if they have used them in a transportation class or if they plan to use them. Professors who have ordered the modules should be contacted and also the reviewers and field testers identified in Appendix F. If they have not used the materials, talk with them about their courses and interests. If they have, go to step 2.

2. Determine how the modules were used. Ask the professor when the module was used and who it was used with. Ask for the reaction of the educator and of the students. Ask if the professor intends to use the modules again. Determine if the modules are considered valuable and/or useful. If the transportation educators are not positive about the benefits of the modules, thank them for their time and promise to keep them informed about the project. If they are positive, go to step 3.

3. Promote professor interest in diffusion activities. Ask if the adopter would talk to educators in similar disciplines with questions about the modules if they were referred by the change agent. Determine if the adopter is interested in writing a review or an article about the modules. Determine if the adopter would be interested in participating in a panel discussion about the project at a conference. Ask if the professor can think of opportunities to assist in diffusing the modules.

4. Follow-up on contacts with adopters. If they express interest in a certain method of helping the diffusion process, arrange for them to implement it. Send letters confirming phone conversations. Consider sending a mailing to adopters with information on how other adopters have used the modules. Be on the lookout for opportunities to involve adopters in any way in the diffusion process.

5. Keep careful records of all adopters and those who have tried using the modules. Examine the adopter file regularly. Record all conversations with adopters for use in evaluations and ongoing project planning.

Notes on the Implementation of Adoption Tactics

The adoption tactics are based on direct personal contact between the change agents and the potential adopters. The decision to adopt an innovation is a personal one and there is no one way to promote positive decisions. The adoption tactics described above are less the blueprints of the diffusion phase and more guidelines for what is by nature a complex and human process.

In a similar vein, the results of adoption tactics are difficult to measure directly in most cases. It is therefore extremely important to keep extensive records of personal contacts with transportation educators to provide as much feedback as possible about the effects of change agent actions.

Expected Outcomes of Adoption Tactics

It is expected that the implementation of the above tactics will result in:

- o Adoption of modules by transportation educators;
- o Formation of an informal network of professors who support the transfer of UMTA/SMD knowledge in this manner;
- o An increase in feedback regarding the project and the diffusion methods; and
- o The development of a valuable database about this type of diffusion/adoption effort.

Phase 4 Evaluation of the Diffusion/Adoption Process

The objective of the evaluation phase of the project is to provide ongoing and summative feedback about the results of the diffusion/adoption plan. The analysis of this feedback will facilitate improvements in the implementation of this and future diffusion/adoption plans.

Procedures for Formative Evaluations

1. Meet on a weekly basis to plan the activities of the coming week based on: the detailed project plan developed at the beginning of the year; this diffusion/adoption plan; and a weekly report of the activities accomplished preceding the meeting.

2. Collect the project records on a monthly basis and meet to discuss the successes and problems of implementing the diffusion/adoption plan. Use these meetings to fine tune the future month's plans and keep a written record of the main decisions of the meeting.

3. Hold daylong evaluation meetings every three months to decide if any redirections of the project are necessary. Evaluate the implementation, costs, logistics and visible results of each tactic to determine if it should be continued as is, expanded, or redirected. Discuss the success of the project as a whole in light of project goals and accomplishments. Keep a detailed record of the team analysis and the resulting decisions.

Procedures for the Summative Evaluation

1. Conduct phone and written surveys of randomly selected transportation educators from the project mailing list near the end of the one year d/a plan trial. Inquire about knowledge of the modules, use

of the modules, and opinions of the diffusion/adoption methods utilized. Collate and analyze the survey results.

2. Prepare a summary of the formative evaluations including the costs and benefits of the tactics employed and any alterations which were made to this diffusion/adoption plan.

3. Collate and analyze project records resulting from the detailed notes of the project team and prepare an analysis based on the total numbers of: queries to the project; module orders; presentations made; conferences attended; and known adoptions.

4. Prepare a final evaluation report of the one year diffusion/adoption plan implementation based on the report sections prepared in steps 1, 2 and 3.

5. Prepare a revised diffusion/adoption plan for the future diffusion of instructional materials to transportation educators in colleges and univeristies based on the evaluation of this plan's results.

Suggested Order of Plan Implementation

1. Organize the diffusion/adoption team and office.

2. Study modules, diffusion/adoption plan, and final reports of 1983 and 1985 WVU transportation education projects. If necessary, train the change agent through meetings with UMTA/SMD personnel in Washington, members of the WVU project team, and transportation educators.

3. Contact professional associations listed in Appendix C and related periodicals listed in appendix D and obtain information needed for implementation of diffusion phase tactics.

4. Prepare a mailing package utilizing the brochure in Appendix F as a model. Print the brochure with the project's address and phone number on it. Utilize the mailing list in Appendix E with any added names which may have resulted from contacting professional associations. Mail the package to educators on the mailing list.

5. Write articles, and press releases based on the project and submit them. A sample article is included as Appendix G. Also plan conference presentations and discussions as arranged.

6. As schedule dictates attend conferences. Follow-up all conference contacts with letters or phone calls. Keep a record of all contacts. Distribute brochures widely.

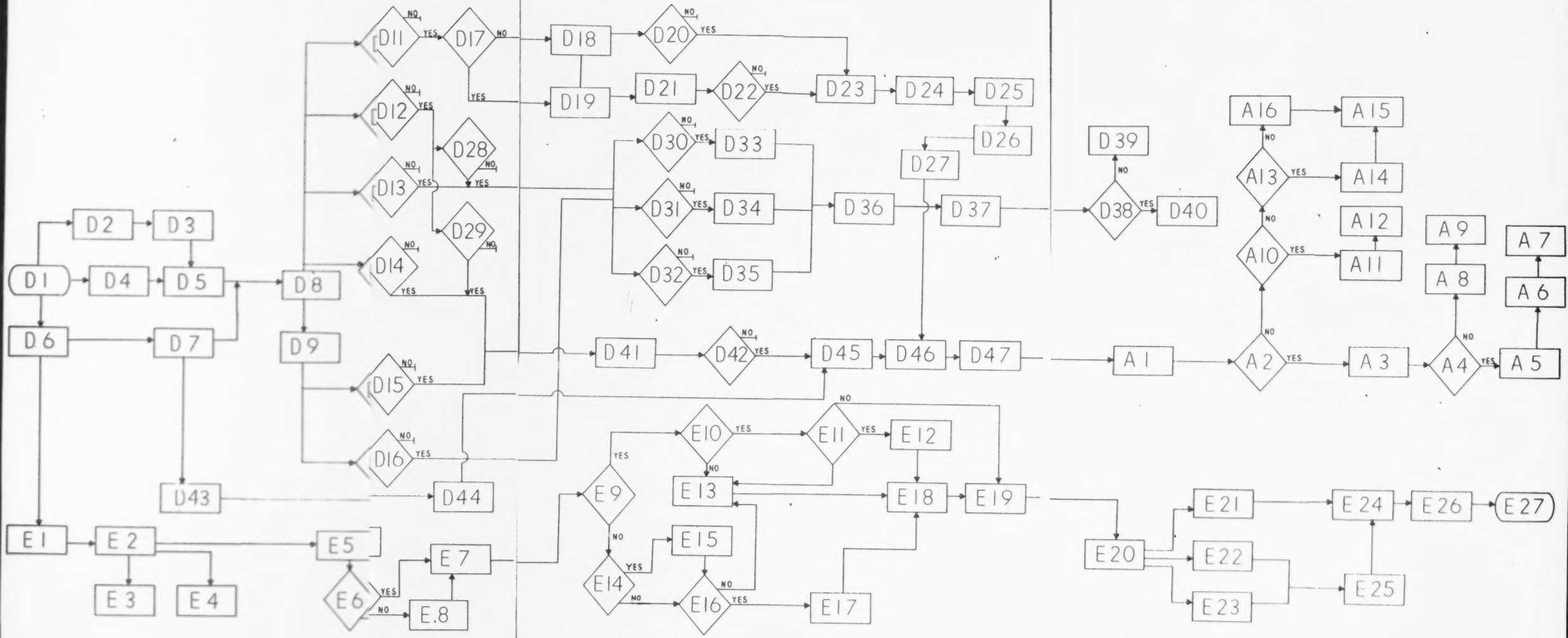
7. As mailing replies come in contact each repondent by phone and letter. Ship modules quickly. Keep a list of the names and addresses of all respondents and their questions. Keep a list of those who order.

8. Follow-up all orders by phone two weeks after mailing and ask if they received the modules and if they have any comments or plans to use them. Based on their initial responses, contact them again when indicated.

9. If professors have used the modules, put them on the field trial list and if they respond positively about the units or mention plans for continued use, put their names in the adopter file. Utilize previous directions for regular contact with early adopters.

10. Conduct formative and summative evaluations as indicated previously.

Flow Chart of Diffusion/Adoption Plan



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FLOWCHART FOR DIFFUSION/ADOPTION PLAN

Actions starting with "D" are in the Diffusion phase of the plan. Those starting with "A" are in the Adoption phase and those preceded by an "E" relate to the Evaluation phase.

Diffusion Phase

D1 Start implementation of diffusion/adoption plan
D2 Establish system to schedule and record phone calls
D3 Role play phone calls as per d/a plan
D4 Organize offfice, budget, and staff
D5 Review d/a plan and materials and develop specific PERT
D6 Set-up comprehensive records system
D7 Train change agent, if necessary
D8 Call associations with transportation educator members
D9 Call publications with transportation educator readers
D11 Do they have conferences relevant to transportation educators?
D12 Do they have transportation or education subcommittees?
D13 Do they have publications relevant to transportation educators?
D14 Do they have mailing lists of transportation educators?
D15 Do they have mailing lists of transportation educators?
D16 Do they have publications relevant to transportation educators?
D17 Will conference accept papers on transportation education topics?
D18 Evaluate accessibility of transportation educastors at conference
D19 Obtain procedures for presenting at conference
D20 Is it advisable to attend conference anyway?
D21 Prepare and submit paper for presentation
D22 Is paper accepted for presentation at conference?
D23 Develop specific promotional plan for conference
D24 Arrange display, handouts and presentations
D25 Attend conference
D26 Keep records of meetings, names, and addresses
D27 Add conference addresses to mailing list
D28 Do they have publications relevant to transportation educators?
D29 Do they have mailing lists of transportation educators?
D30 Do they publish public service announcements?
D31 Do they publish reviews of transportation education materials?
D32 Do they publish articles on transportation education topics?
D33 Obtain criteria and procedures for submission of public service ads.
D34 Obtain criteria and procedures for submission of materials for review
D35 Obtain criteria and procedures for submission of academic articles
D36 Produce and submit materials for publication
D37 Follow-up submission after two weeks and talk to editor
D38 Is submission chosen for publication?
D39 Follow-up with editor for possible future publications
D40 Get copies of publication and keep related records
D41 Discover and evaluate conditions to obtain mailing list
D42 Is it advisable to obtain mailing list?
D43 Update brochure with address and take to printer
D44 Prepare cover letter for brochure mailing
D45 Obtain mailing list and add names to master list
D46 Prepare and mail package with brochures to mailing list
D47 Record and respond to inquiries and orders

Adoption Phase

A1 Follow-up all orders with phone calls after one month
A2 Has the module been used?
A3 Determine and record how module was used
A4 Does professor recommend module as valuable?
A5 Ask them if and how they might help diffuse the modules
A6 Thank them, record call summary, and try to arrange personal meeting
A7 Follow-up offers, try to arrange opportunities and keep records
A8 Discuss reasons, recommendations, and uses of modules
A9 Thank person and record call summary
A10 Is there a plan to use the module?
A11 Discuss and encourage potential use of module
A12 Thank person, record call, and set call-back time
A13 Has professor looked at the module?
A14 Discuss their courses and impressions of the modules
A15 End call and record call summary
A16 Encourage them and thank them for their time

Evaluation Phase

E1 Design data collection systems
E2 Design criteria for tactic evaluations
E3 Hold weekly meetings to sequence specific tasks and monitor progress
E4 Hold monthly meetings to schedule and discuss future months actions
E5 Hold formative evaluation after three months
E6 Are records current and complete?
E7 Evaluate each tactic results based on criteria
E8 Update and complete records
E9 Has the tactic been successful?
E10 Should we do more of this tactic?
E11 Can we do more of this tactic?
E12 Increase resources devoted to tactic and evaluate at next interval
E13 Maintain original use of tactic and evaluate at next interval
E14 Should the tactic be altered?
E15 Alter tactic and implement changes
E16 Should we do less of this tactic?
E17 Decrease resources devoted to tactic and evaluate at next interval
E18 Evaluate results of changed tactic using criteria
E19 Record evaluation results and plan of action for summative evaluation
E20 Review procedures for summative evaluation
E21 Analyze formative evaluations and project records
E22 Conduct surveys on attitudes towards modules and diffusion tactics
E23 Review original diffusion/adoption plan
E24 Prepare summative evaluation report
E25 Analyze survey results
E26 Revise diffusion/adoption plan
E27 Continue revised diffusion/adoption process. Return to start

Appendix A - A Brief Summary of Diffusion Research

A Brief Summary of Diffusion Research

Introduction

Technology transfer is the process by which science and technology are diffused through human activity. Wherever systematic rational knowledge developed by one group or institution is embodied in a way of doing things by other institutions or groups, we have technology transfer (Brooks, H. cited in Mogavero, L. N. & Shane, R. S., 1982, p. 5). Mogavero and Shane themselves define technology transfer more concisely (1982, p. 1) as "putting knowledge to use." There are many types of technology transfer both voluntary and involuntary. We are concerned here with situations where the possessor of the technology wishes it to be transferred successfully "with the express purpose of achieving social or economic benefits" (Blozitis, 1975, p. 5)

Assuming the innovation to be transferred is indeed beneficial for the potential users, the key question becomes, "How can communication activities be designed to increase the chances of acceptance of new products or ideas by ..(target).. groups in the population." (Heidebro, 1982, p. 25) Technology transfer is basically a human and not a technical process and thus has been studied far more by social scientists than engineers.

The study of this type of technology transfer is called diffusion research and it has close ties to both marketing and communications theory. Diffusion research is based on the theory that innovations, regardless of type, are adopted on the basis of certain logical patterns connected to the following factors:

- o the characteristics of the innovation;
- o the characteristics of the adopters;
- o the characteristics of the information channels used; and
- o the actions of any innovation proponents or change agents.

Everett M. Rogers, the dean of diffusion research, states (1983, p. 5)) :

> Diffusion is the process by which an innovation is communicated through certain channels over time to the members of a social system. It is a special type of communication, in that the messages are concerned with ideas.

The major contributions of diffusion research have been related to the identification and interrelationships of the above factors. This summmary will review diffusion research and its implications for those wishing to promote successful transfers of beneficial technologies.

Phases of the Adoption Process

In marketing the four phases of the purchase (or product adoption) process are attention, interest, desire, and action. Once the initial purchase is made the model is finished. Adoption of an innovation, however, requires regular use of the innovation and so it includes a trial stage and the possibility that the potential adopter tries the innovation but does not adopt it permanently.

Rogers (1983) discusses five stages in the innovation- decision process. They are knowledge, persuasion, decision, implementation and confirmation. Usually the potential adopter has some felt need or problem which leads to the search for knowledge about a particular innovation.

The individual then forms a favorable or unfavorable opinion about the innovation. A decision is then made to adopt or reject the innovation which, if positive, leads to its implementation. Confirmation occurs when the adopter, or non-adopter decides that their decision is final and correct.

For someone trying to promote the adoption of a certain innovation, the Knowledge, Persuasion and Decision stages are critical. Ideally, a change agent would reach the entire social system with informational materials and then have the time and means to meet individually with all interested members to discuss their personal concerns and needs. He, or she, would then provide for a no-cost, no-risk trial of the innovation.

In reality, "ideally" rarely occurs, but, even if it did, not all people would adopt an innovation at the same time even if it was equally beneficial for each. Technology transfer is a human process and people react in a plethora of ways to an identical situation. Research has identified certain theoretical categories of adopters based on the time of adoption. These categories have been verified by a large number of linear retrospective adoption studies.

Categories of Adopters

Given a population of people in the same social system who have adopted a certain innovation, the graph of those adopting in given time periods generally reflects the standard bell curve. The five adopter categories which are discussed below represent ideal types (Rogers, 1983).

Innovators are the first group of adopters of any innovation. They tend to be cosmopolitan, venturesome and eager to try new ideas. They

also tend to well educated and well off in comparison to others in their social system. Usually, they are not opinion leaders in their group but are rather considered as oddballs and their example does not usually motivate others to adopt. They represent less than 3% of a typical social group.

Early Adopters, unlike innovators, tend to be locally oriented and to command the respect of their peers. Adopters in later groups tend to check the opinions of early adopters before they adopt. Early adopters, like innovators tend to have more education and resources than their peers.

The Early Majority represents about one-third of the adopting population. They interact frequently with both those adopting earlier and later but they are deliberate in their decision to adopt and they spend a relatively longer time in each adoptiion phase than earlier adopters. The Late Majority represents another third of the group and is characterised by their skepticism about change. They may have more to lose if an innovation does not work and so they require seeing the innovation working successfully around them before they will even consider trying it.

Laggards are extremely locally-oriented and resistant to change. They are almost never opinion leaders. Their extreme respect for tradition and relatively low level of peer interactions helps to explain why they are the last to make changes that others around them have already made. As Rogers notes, the term laggard is derogatory due to the pro-innovation bias of much diffusion research. So-called laggards sometimes have appeared ahead of their times particularly those who refused to adopt such innovations as Thalidomide or DDT.

Adopter categories become visible after an innovation has achieved widespread adoption and thus, they are of little value in explaining processes by which innovations are rejected by a social system. The key adoption processes occur within the interpersonal and communication networks of the social system. Little is known about the effect of specific types of social networks on diffusion because it is far more difficult to research than questions of who adopted what when.

One area which has been extensively researched and is relevant to the task of an innovation diffuser is the question of which attributes of innovations facilitate the adoption process.

Attributes of Innovations and the Adoption Process

Generally speaking, innovations are put into practice because they are "advantageous, simple, easy to try, easy to measure, and inexpensive" (Schmitt & Beimborn, 1984, p. 2). Rogers (1983, p. 211) states more academically that the attributes of innovations which facilitate adoption are "relative advantage, compatibility, complexity, trialability, and observability."

The most critical question is whether the innovation offers a significant advantage over the practices it is intended to replace. Without this factor, it is a waste of everyone's time to even discuss it. As we will discuss later, it is the responsibility of a potential change agent to thoroughly research whether the innovation to be diffused is truly beneficial for the recipients. Otherwise, a diffusion effort is undertaken for the benefit of the disseminator as in a sales situation.

Simplicity refers to the ease with which the new innovation can be understood by potential adopters. No one wishes to invest their time and

resources using some novelty which they do not understand due to the risks of confusion and failure.

A related factor is the innovation's trialability or the ease with which it can be tried on a limited, and inexpensive, basis. A school principal risks less permitting an eager teacher to try a new math teaching technique than he or she would with a total school trial of modular scheduling. Failure in the latter case would be more disruptive and public.

An innovation's advantages may be real but adoption will still be very difficult if its advantages do not permit ease of measurement. Many innovations require implementation of certain ideas. The benefits of such changes are usually harder to see than the benefits from a new piece of hardware. Experts preach the utility of applying consistent behavioral standards in child-rearing and teaching but a switch to this approach may not yield beneficial results for months if they can be directly assessed at all.

Basically, if an innovation offers a clear advantage and it is easy to understand, try, and use then it will be adopted at relatively rapid rate. The only exception relates to the compatibility of the innovation with existing procedures and values of the social system. People selectively perceive reality based on their beliefs and an innovation whose success would challenge widely held views can often be doomed even if all other factors are in its favor. Another aspect of compatibility refers to vested interests within the social system who may be threatened by a particular innovation.

The way in which an innovation is presented can have major impacts on how its advantages are viewed. A lengthy, technical description can

leave the impression that an innovation is difficult to use and understand while short conceptual summaries can gain the positive interest of potential adopters far more effectively. Reference to these factors is critical in the development of any strategy to promote change.

The Role of the Change Agent

Rogers (1983) informs us that a change agent "influences clients' innovation decisions in a direction deemed desirable by a change agency." Typical change agents are overseas development workers and agriculture extension agents. Their jobs involve interacting in target social systems to promote specific beneficial innovations.

Technology transfer is a complex human proess and the most important skills a change agent needs are human relations and intellectual competence (Scmitt, Mulroy, & Beimborn, 1984). The change agent has an initial responsibility to assess the primary and secondary impacts of the innovations to be promoted. The next step is to thoroughly investigate the target social system, so that the diffusion effort can begin.

The change agent's two most important assets In a community are homophily and credibility. Homophily refers to the similarity of attitudes, beliefs and status between the change agent and the potential adopters. Research supports what common sense indicates- that it is easier for a village resident to foster adoption of modern health practices among her peers than for a visiting American nurse.

However, the nurse would probably know more about the reasons for the new practices which makes her and the resident a strong team. Many development projects have been organized along a similar model with an educated outsider working with and training local residents to diffuse

beneficial innovations.

Credibility is so critical because early adopters must often take substantial risks solely on the basis of information provided by the change agent. Therefore, the case for the innovation must not be overstated, and its costs and risks must be fully explained. Once a change agent's credibility is undermined there is rarely a second chance for success.

The methods used by a change agent to disseminate information about a desired innovation must be based on the nature of the targeted social system. A village project requires daily and intense interpersonal contacts while an attempt to promote safety techniques among American traffic engineers would probably require a mixture of personal and impersonal approaches due to the scattered locations of the target group. Information channels have varying characteristics in the adoption process and a change agent must carefully plan their use.

Characteristics of Information Channels

There are an infinite variety of ways to communicate but they can be classed into three groups: speaking, writing and showing (Scmitt et al, 1984, p. 18). Rogers (1983) divides information channels into mass and interpersonal ones. The mass media channels of Rogers include all communication which is not directly face-to-face such as publications, presentations and radio. Speaking, and some showing, would fall in the category of interpersonal communication.

When properly utilized, mass media channels provide a low-cost means of providing information to many people particularly when they are geographically scattered. Mass media channels tend to be less useful in

overcoming doubts or answering individual questions. Interpersonal contact is a valuable and intense form of communication but it is limited by its large costs, particularly in time.

Beal and Bohlen (1957) indicate and other research confirms (Rogers, 1983) that mass media is most effective in the Knowledge phase of the innovation- decision process and that it is most effective with early adopters who tend to be more cosmopolitan and media-oriented than their peers. Interpersonal contact is critical during the Decision phase of the adoption process and with later adopters. However, it is not necessary that all interpersonal contact be with a change agent. In fact, contact with early adopting peers is far more effective in persuading others to adopt than contact with an external change agent.

In modern practice there are communication channels which combine the characteristics of mass and interpersonal contact. Two main ones are the telephone and the meeting or presentation. The phone, where available, permits a contact almost as personal as face to face over long distances and at a cost far less than even one visit. Meetings permit the communication of information about innovations to a group of potential adopters but they also permit some interpersonal contact and feedback during question periods and informally after sessions.

Both of these combination methods can be extremely useful particularly in conjunction with traditional mass and interpersonal approaches. Channels of communication are not mutually exclusive and the use of multiple channels has been shown repeatedly to be more effective than any single one (Menzel, 1966; Havelock, 1970; Scmitt et al, 1984).

Showing an innovation can also be very effective in making its benefits generally known. Demonstrations tend to have very high

credibility particularly if they are done in the setting where they are intended for use. The most common example of this approach (and the genesis of the phrase "field trial") is the agricultural demonstrations of new farming techniques on a local plot or part of a farmer's fields.

Evaluation of Technology Transfer

Bob Krull has been travelling in a media equipped van for eight years transferring innovations in highway maintenance and safety practices across the Western U.S. He has made thousands of presentations and he notices techniques which he has promoted being used on subsequent visits to given areas. How does he evaluate his success?

> With technology transfer, addressing the problem of program evaluation is very difficult as there are seldom any easily identifiable beans to be counted. (1985, p. 21)

Krull points out that no one has ever approached him to say that his presentation caused the use of a certain innovation which had a specified positive effect. Technology transfer requires many sources and his most positive conclusion is that he is sure his presentations are among them. He also notes the flow of requests for his services and newsletter.

It is usually possible to determine retrospectively how many people have adopted a given innovation but it is usually not possible to tell how much of the adoption was the result of a given change agent due to the importance of internal social networks and multiple information sources. The only feasible plan for a change agent in terms of evaluation is to keep detailed records of all contacts: information requests, phone calls, materials distributed and so on.

Such ongoing formative evaluation facilitates the change agent's job

of adapting plans to changing circumstances and provides one basis for a summative evaluation at the end of a preselected time period. Informal contacts and comments can also provide the change agent with subjective, but valuable, clues as to the effects of his or her efforts.

A formal survey can be valuable as a central component of a summative evaluation when used to determine both the extent of adoption and the respondents' memory and opinions of the diffusion efforts. Scmitt et al (1985, p. 54) summarize their thoughts on evaluation:

> Use a combination of evaluation methods because individual users will respond differently, both to the separate program elements and to the methods used to evaluate them. Above all, always get face-to-face verbal feedback.

All writers on technology transfer emphasize that it is a slow, difficult and demanding process. Most use the phrase "resistance to change" as a catch-all for the many reasons why people will select techniques about which they know what to do and what will probably happen over any innovation - no matter how highly recommended it is. Using rational approaches and ideas to overcome these entrenched barriers is a human relations and communications problem of the most complex and difficult kind. The most a change agent can expect is that he or she will accelerate this process.

Appendix B - Reference List on Diffusion Research

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Appendix C - Professional Associations with Transportation Educator Members

Professional Associations with Transportation Educator Members

American Marketing Association (AMA)
American Political Science Association (APSA)
American Society of Civil Engineers (ASCE)
    Urban Transportation Division
    Education Committee
American Sociological Association (ASA)
American Planning Association (APA)
    Transportation Division Meetings
    Urban Planning Division
American Society of Public Administrators (ASPA)
    Education Committee
Association of American Geographers (AAG)
Institute of Transportation Engineers (ITE)
International Technology Education Association (ITEA)
National Council for Physical Distribution Management (NCPDM)
Transportation Research Board (TRB)
    Education Committee
    Committees on Paratransit, Rural Transportation, and so on.
    University Representatives
Transportation Research Forum (TRF)

Appendix D - Periodicals with Transportation Educator Readers

Periodicals with Transportation Educator Readers

Engineering Education
Mass Transit
TR News
Transportation Quarterly
Transportation Research

Other journal of associations listed in Appendix C

Appendix E - List of Field Testers and Field Reviewers

Field Reviewers and Field Testers
Of UMTA/WVU Transportation Education Project
Instructional Modules
1983 - 1985

Paratransit Module

Field Reviewers

Lester Hoel
University of Virginia

Jay Smith
North Texas State University

Arun Chatterjee and students
University of Tennessee

James Reading, T. Jones, W. Kelly, and R. Carmichael
COTA, Columbus, Ohio

David P. Middendorf
Michael S. Bronzini
University of Tennessee

C. S. Papacostas
University of Hawaii

Field Testers

Jon Epps
University of Nevada

Mary Kihl
Iowa State University

Shinya Kikuchi
University of Delaware

Leon Zuehls
Northeast Wisconsin
Technical Institute

Field Reviewers(cont)

Andrew Farkas
Morgan State University

Jotin Khisty
University of Washington

Transportation Brokerage

Field Reviewers

Jorge Barriga
San Jose State University

Frank McKelvey
Michigan State University

Edward Neumann
West Virginia University

Abayomi Ajayi-Majebe
Ohio State Universtiy

James H. Miller
Penn State University

Field Testers

Paul Basha
St. Martin's College, WA

William Pollard
University of Colorado

Field Reviewer (Cont.)

Peter Shaw
California State University - Long Beach

Public Transportation Pricing

Field Reviewers

Richard P. Guenthner
Marquette University

Robert Cervero
University of California - Berkeley

Gordon "Pete" Fielding
University of California - Irvine

Katie Dorsett
North Carolina A & T

Sue Knapp
Ecosometrics, Bethesda, MD

Field Testers

Zoltan Nemeth
Ohio State University

Larry Cooper
Texas Southern University

William Pollard
University of Colorado

Shinya Kikuchi
University of Delaware

Field Reviewer (cont.)

Lester Hoel
University of Virginia

Rural Public Transportation

Field Reviewers

Patricia Weaver
University of Kansas

Sheldon Edner
Portland State University

Edmund Jansen
University of New Hampshire

Susan O'Connell
WV Transportation Division

Barbara Price
Rural America, Inc.

Randy Isaacs
National Association for Transportation Alternatives

C. Michael Walton, chair, and members
TRB Committee on Transportation Planning Needs and Requirements of Small and Medium-Sized Communities

Field Testers

Anthony Schwaller
St. Cloud State University, MN

Charles Dare
University of Missouri - Rolla

Alice Kidder
Babson College, MA

Shinya Kikuchi
University of Delaware

Arland Hicks
University of Kansas

Market Segmentation

Field Reviewers

Ellen Foster Curtis
Northeastern University

Michael McGuire
Niagara University

Norbert Oppenheim
City College of New York

George Smerk
Institute for Urban Transportation, IN

James Reading
Jim Ahlstrom
COTA, Columbus, OH

Field Testers

Tim Kubiak
Eastern Kentucky University

Zoltan Nemeth
Ohio State University

Edward Neumann
West Virginia University

John Collura
University of Massachusetts

Field Reviewer (Cont.)

James H. Miller
Penn State University

Appendix F - Abstract of sample academic article

Abstract of sample academic article
(Article available on request from authors)

ABSTRACT

NEW CONTENT FOR THE NEW TRANSPORTATION PROFESSIONAL: THE UMTA/WVU TRANSPORTATION EDUCATION PROJECT

By: Peter H. Wright and
Paul W. DeVore
Transportation Education Project
West Virginia University
Morgantown, WV

Deregulation of the freight and airline industries and major structural stresses in public transportation have increased management responsibilities. Different skills and knowledge are now required by transportation professionals due to the variety and complexity of social, legal, economic, and technical factors. New systems and planning skills are needed along with knowledge of current research results. The UMTA Office of Service and Methods Demonstrations (SMD) has developed valuable knowledge about innovative transit services and management techniques.

UMTA has initiated an effort to transfer such research findings to future transportation professionals. To transfer knowledge about new transit services and techiques UMTA/SMD funded the Program for the Study of Technology at West Virginia University (WVU) to develop flexible, concept-based introductory instructional modules based on SMD findings.

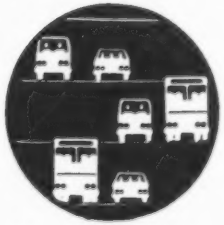
Five instructional units were developed and then tested in a variety of higher education classrooms. Most professors reacted positively to the new content and the instructional module design. A diffusion/adoption plan was also developed to promote the use of these units by transportation educators.

This technology transfer method is promising and its use should be considered by other transportation agencies such as the FHWA and FAA which have a significant research base that should be transferred to education programs for the preparation of future transportation professionals.

Appendix G - Prototype brochure promoting use of modules

Prototype brochure promoting use of modules

Public transportation has entered an exciting era as new and alternative means have been developed to address transportation needs and markets. To assist transportation educators to teach about recently demonstrated techniques in the planning and operation of public systems flexible, easy-to-use instructional modules have been developed. These modules were derived from the results of UMTA field demonstrations. Each module provides from one to three class hours of college-level instruction focused on the planning and management of targeted and cost-effective public transportation services.



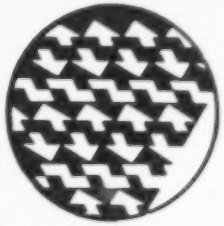
PARATRANSIT

Planning and operating transportation systems on the continuum between drive-alone automobiles and fixed schedule buses.

MARKET SEGMENTATION

A transportation planning approach which targets services to groups of people representing similar markets and needs.

TRANSPORTATION BROKERAGE



A role through which managers can meet specific transportation needs with a variety of flexible, cost-effective services.

TRANSPORTATION PRICING

Factors and options in the design of efficient and equitable fare structures and fare collection mechanisms.

RURAL PUBLIC TRANSPORTATION

Meeting pressing rural transportation needs through local cooperation, organization, and creativity.

Return card by tearing off at perforation and mailing it now

POSTAGE IS PAID

Yes...

PLEASE SEND THE FOLLOWING MODULES AND BILL ME AT THE ADDRESS BELOW ($5.00 EACH + SHIPPING) *

___ PARATRANSIT
___ MARKET SEGMENTATION
___ TRANSPORTATION BROKERAGE
___ TRANSPORTATION PRICING
___ RURAL PUBLIC TRANSPORTATION

Name _____

College/University _____

Address _____

City _____ State _____ Zip _____

Signature _____

* DUE TO THE CONCEPTUAL NATURE, SOME OVERLAP OCCURS BETWEEN MODULES

BUSINESS REPLY MAIL

Background of the Project

In 1983, the Technology Education Program at West Virginia University began to develop instructional modules to provide easy access by faculty in higher education to the findings of UMTA's Service and Methods Demonstrations. SMD's demonstrations have resulted in improved public transportation planning and management practices for new operating environments characterized by shifting resources, and an explosion of modal, funding, and private sector options.

Five flexible, concept-based instructional modules have been developed, externally reviewed, and field tested by transportation educators. These modules are now ready for use.

Appendix H - Foundation of Transportation Educator Mailing List

Foundation of Transportation Educator Mailing List

This list contains the names of over 500 Transportation Educators. Due to space limitations, this list is not included in this copy of the D/A plan. Please contact the authors or UMTA's Office of Service and Management Demonstrations if you are interested in the possibility of obtaining this list.